

JEE MAIN INTEGRALS — INTEGRATION BY PARTS — PYQS

Max. Marks: 40

Questions: 10

Section A (MCQ) — 7 questions

Q.1 Let $f(t) = \int \left(\frac{1 - \sin(\log_e t)}{1 - \cos(\log_e t)} \right) dt$, $t > 1$.

If $f(e^{\pi/2}) = -e^{\pi/2}$ and $f(e^{\pi/4}) = \alpha e^{\pi/4}$, then α equals

[JEE Main 2026 (Online) 24th January Morning Shift]

- (1) $1 + \sqrt{2}$ (2) $-1 - 2\sqrt{2}$
(3) $-1 - \sqrt{2}$ (4) $-1 + \sqrt{2}$

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Q.2 Let $f(x) = \int \frac{(2-x^2) \cdot e^x}{(\sqrt{1+x})(1-x)^{3/2}} dx$. If $f(0) = 0$, then $f\left(\frac{1}{2}\right)$ is equal to:

[JEE Main 2026 (Online) 23rd January Morning Shift]

- (1) $\sqrt{2e} - 1$ (2) $\sqrt{2e} + 1$
(3) $\sqrt{3e} - 1$ (4) $\sqrt{3e} + 1$

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Q.3 Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a twice differentiable function such that $f(2) = 1$. If $F(x) = xf(x)$ for all $x \in \mathbb{R}$, $\int_0^2 xF'(x) dx = 6$ and $\int_0^2 x^2 F''(x) dx = 40$, then $F'(2) + \int_0^2 F(x) dx$ is equal to:

[JEE Main 2025 (Online) 28th January Evening Shift]

- (1) 13 (2) 11 (3) 9 (4) 15

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Q.4 Let $\int x^3 \sin x dx = g(x) + C$, where C is the constant of integration. If

$8\left(g\left(\frac{\pi}{2}\right) + g'\left(\frac{\pi}{2}\right)\right) = \alpha\pi^3 + \beta\pi^2 + \gamma$, $\alpha, \beta, \gamma \in \mathbb{Z}$, then $\alpha + \beta - \gamma$ equals :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 47 (2) 55 (3) 62 (4) 48

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Q.5 Let for

$f(x) = 7\tan^8 x + 7\tan^6 x - 3\tan^4 x - 3\tan^2 x$, $I_1 = \int_0^{\pi/4} f(x) dx$ and $I_2 = \int_0^{\pi/4} x f(x) dx$. Then $7I_1 + 12I_2$ is equal to :

[JEE Main 2025 (Online) 22nd January Morning Shift]

- (1) 2π (2) 1 (3) π (4) 2

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Q.6 If $\int e^x \left(\frac{x \sin^{-1} x}{\sqrt{1-x^2}} + \frac{\sin^{-1} x}{(1-x^2)^{3/2}} + \frac{x}{1-x^2} \right) dx = g(x) + C$, where C is the constant of integration, then $g\left(\frac{1}{2}\right)$ equals :

[JEE Main 2025 (Online) 22nd January Evening Shift]

- (1) $\frac{\pi}{6} \sqrt{\frac{e}{3}}$ (2) $\frac{\pi}{6} \sqrt{\frac{e}{2}}$ (3) $\frac{\pi}{4} \sqrt{\frac{e}{3}}$ (4) $\frac{\pi}{4} \sqrt{\frac{e}{2}}$

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Q.7 The value of the integral $\int_{-1}^2 \log_e (x + \sqrt{x^2 + 1}) dx$ is

[JEE Main 2024 (Online) 9th April Evening Shift]

- (1) $\sqrt{5} - \sqrt{2} + \log_e \left(\frac{7+4\sqrt{5}}{1+\sqrt{2}} \right)$
(2) $\sqrt{2} - \sqrt{5} + \log_e \left(\frac{7+4\sqrt{5}}{1+\sqrt{2}} \right)$
(3) $\sqrt{5} - \sqrt{2} + \log_e \left(\frac{9+4\sqrt{5}}{1+\sqrt{2}} \right)$
(4) $\sqrt{2} - \sqrt{5} + \log_e \left(\frac{9+4\sqrt{5}}{1+\sqrt{2}} \right)$

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Section B (Numerical) — 3 questions

Q.8 The number of elements in the set $S = \{x : x \in [0, 100] \text{ and } \int_0^x t^2 \sin(x-t) dt = x^2\}$ is

[JEE Main 2026 (Online) 23rd January Evening Shift]

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Q.9 If $\int_0^1 4 \cot^{-1}(1-2x+4x^2) dx = a \tan^{-1}(2) - b \log_e(5)$, where $a, b \in \mathbb{N}$, then $(2a+b)$ is equal to _____.

[JEE Main 2026 (Online) 21st January Evening Shift]

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Q.10 If $\int \operatorname{cosec}^5 x \, dx = \alpha \cot x \operatorname{cosec} x \left(\operatorname{cosec}^2 x + \frac{3}{2} \right) + \beta \log_e \left| \tan \frac{x}{2} \right| + C$ where $\alpha, \beta \in \mathbb{R}$ and C is the constant of integration, then the value of $8(\alpha + \beta)$ equals _____.

[JEE Main 2024 (Online) 4th April Evening Shift]

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full solution



ANSWER KEY

Section A (MCQ) — 7 questions

Ques.	1	2	3	4	5	6	7				
Ans.	3	3	2	2	2	1	4				

Section B (Numerical) — 3 questions

Ques.	8	9	10								
Ans.	16	9	1								